

Slow light engineering by chirped photonic crystal waveguides

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Slow light is expected to allow optical buffer memory, strong light-matter interaction, and so forth. In photonic crystal waveguides, slow light propagation occurs due to the large structural dispersion at band edges and local flat bands. The constraint between the speed reducing ratio and the frequency band is moderately expanded by the chirped structure [1]. The large dispersion accompanied by the slow light is well compensated by a directional coupler [2] and/or fine structural tuning [3]. Thus, the distortion-free slow optical pulse is obtained. Since no unrealistic conditions are required in these structures, the expected effect will be observed in the standard photonic crystal slab. The tuning of refractive index profile is an important challenge, which gives the tunability for the optical delay. The optical loss will also be compensated by efficient optical amplification for the slow light. In this case, a relatively large leakage loss can be acceptable in a deep hole waveguide structure, which is advantageous for the electrical pumping and heat sinking.

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